

What is claimed is:

1) A composition of matter useful as a phosphor in light emitting diodes, which comprises a material described by the formula:



in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn, subject to the proviso that Zn is not solely present;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn;

wherein the total amount of B present is any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between about 0 and about 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.

2) A composition according to claim 1 wherein  $0 \leq x \leq 1$  and  $0 \leq y \leq 1$ .

3) A composition according to claim 1 wherein  $0.5 \leq x \leq 1$  and  $0 \leq y \leq 0.5$ .

4) A composition according to claim 1 wherein  $0 \leq x \leq 0.5$  and  $0 \leq y \leq 0.5$ .

- 5) A composition according to claim 1 wherein  $0 \leq x \leq 0.5$  and  $0.5 \leq y \leq 1.0$ .
- 6) A composition according to claim 1 wherein x is about 0 and y is about 1.
- 7) A composition according to claim 1 wherein x is about 1 and y is about 0.
- 8) A composition according to claim 1 wherein M comprises one or more elements selected from the group consisting of: calcium and magnesium.
- 9) A composition according to claim 8 wherein said activator B comprises one or more elements selected from the group consisting of cerium and europium.
- 10) A composition according to claim 1 having the composition  $\text{CaS}_m\text{Se}_n : \text{Ce}$  in which m is about 0.91 and in which n is about 0.09.
- 11) A composition according to claim 1 having the composition  $\text{CaS}_m\text{Se}_n : \text{Ce}$  in which m is about 0.88 and in which n is about 0.12.
- 12) A composition comprising at least two different phosphors according to claim 1.

13) A composition according to claim 1 wherein B comprises a single element selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn.

14) A composition according to claim 1 wherein B comprises two or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn.

15) A composition according to claim 1 wherein M comprises a single element selected from the group consisting of: Be, Mg, Ca, Sr, and Ba.

16) A composition according to claim 1 wherein M comprises two or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, and Zn.

17) A light emitting device comprising:

- a) a light source selected from the group consisting of: light-emitting diodes and lasers,  
wherein said light source emits light having a wavelength of between about 360 and about 480 nanometers; and
- b) a phosphor described by the formula:



in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn, subject to the proviso that Zn is not solely present;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn;

wherein the total amount of B present is any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between about 0 and about 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.

18) A light emitting device according to claim 17 wherein said phosphor emits white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

19) A light emitting device according to claim 17 comprising a mixture of at least two different phosphors described by said formula.

20) A light emitting device according to claim 19, wherein said mixture of phosphors emits white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

21) A light emitting device according to claim 17 wherein M comprises one or more elements selected from the group consisting of: calcium and magnesium.

22) A light emitting device according to claim 17 wherein said activator B comprises one or more elements selected from the group consisting of: cerium and europium.

23) A light emitting device according to claim 17 wherein said phosphor has the composition  $\text{CaS}_m\text{Se}_n : \text{Ce}$  in which m is about 0.91 and in which n is about 0.09.

24) A light emitting device according to claim 17 wherein said phosphor has the composition  $\text{CaS}_m\text{Se}_n : \text{Ce}$  in which m is about 0.88 and in which n is about 0.12.

25) A light emitting device according to claim 17 wherein B comprises a single element selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn.

26) A light emitting device according to claim 17 wherein B comprises two or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Sb, Bi, K, Na, Cl, F, Br, I, Mg, Pr, and Mn.

27) A light emitting device according to claim 17 wherein M comprises a single element selected from the group consisting of: Be, Mg, Ca, Sr, and Ba.

28) A light emitting device according to claim 17 wherein M comprises two or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, and Zn.